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A Review of Occupation and Impairment Based Assessments Used in Occupational Therapy

**Ricardo A. Demetrius, Lillian M. Freeman,
Larry B. Holmes, Hillarie E. Hough, My-Lynn Tran, Ashley R. Steadman,
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Abstract

Objective: The objective of this paper was to analyze the psychometrics, efficacy, and usefulness of assessments to measure occupational performance and occupation-based outcomes.

Methodology: Eight Doctor of Occupational Therapy Students at Nova Southeastern University, along with their professor, analyzed and appraised 46 commonly used assessments to discover and explore the assessments' purposes, theory-bases, psychometric properties, and usefulness as outcome measures.

Results: We found that many high quality assessments exist and meet the standards for validity and reliability. Although some assessments are client-centered and useful, some still require additional research to strengthen their psychometric properties.

Conclusion: Some widely used assessments are better for assessing occupation-based outcomes while others are better for assessing specific client factors. Despite their lack of psychometric information, some of the assessments we analyzed may still be useful in practice.

Keywords: occupational therapy, assessments, evaluation, client factors, theory base, psychometrics, measurements, outcomes

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Evaluation is an essential part of the occupational therapy process. Through observation and assessment, the occupational therapy practitioner is able to plan interventions, justify service for reimbursement, determine whether or not to continue services, evaluate intervention outcomes, and determine program effectiveness.

In the field of occupational therapy, evaluation usually consists of multiple assessment measures including client and/or caregiver interview and observation. There are many assessments used by occupational therapists, so how does the therapist choose the best assessments for use with specific clients? There are many factors that go into a therapist's choice of assessment tools -- theory, cost, what needs to be measured, work environment, availability, client needs, context, etc. The decision can be overwhelming for any occupational therapist, but it can be even more intimidating for the new graduate who has only been exposed to a small fraction of assessment tools on the market.

In their third year of occupational therapy school, entry-level Doctor of Occupational Therapy students at Nova Southeastern University elected to take the course *Applying Measurement Theory to Evaluation*. The course was designed to provide the students with a deeper understanding of the theoretical foundations of measurement and to offer the students the opportunity to refine their abilities to appraise and select assessment tools for both individuals and programs. As an ongoing project of the course, the students collaborated to produce this article, which summarizes their findings of evidence supporting the use of assessments that measure occupational performance and occupation-based outcomes.

The purpose of this review was to analyze psychometrics, efficacy, and usefulness of assessments to measure occupational performance and occupation-based outcomes. We also discuss the evidence supporting the use of these assessments.

Methodology

Along with their professor, the students selected assessments commonly used in practice and evaluated them using the Outcome Measures Rating Form and Guidelines from the CANCHILD Center for Disability Research Institute of Applied Health Sciences, McMaster University (Law, 1994). The selected assessments were reviewed through a process that included reading the assessment manual, using the rating form and guidelines (Law, 1994), and looking for supportive articles that provided current evidence on the assessment tools. The specific focus of the review centered on the strength and availability of psychometric information found in the assessment manual as well as other sources including the overall utility and practicality of the assessment based on in-class practice and demonstration of selected tests. The selected assessments cut across populations from infants and youth to elderly, well population to populations with a variety of conditions and abilities. Selected assessments included:

- Ages & Stages Questionnaire (ASQ-3)
- The Assessment of Communication and Interaction Skills (ACIS)
- The Assessment of Motor and Process Skills (AMPS)
- Bay Area Functional Performance Evaluation (BaFPE)
- The Beery-Buktenica Developmental Test of Visual Motor Integration (Beery VMI)

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- Birth to Three Assessment and Intervention System - Second Edition (BTAIS-2)
- Burks Behavior Rating Scales (BBRS-2) 2nd Ed.
- Canadian Occupational Performance Measure (COPM)
- Child Occupational Self-Assessment (COSA)
- Children's Assessment of Participation and Enjoyment (CAPE) & Preferences for Activities for Children (PAC)
- Clinical Observations of Motor and Postural Skills (COMPS) 2nd Ed.
- The Cognitive Assessment of Minnesota (CAM)
- Craig Handicap Assessment and Reporting Technique (CHART)
- Craig Hospital Inventory of Environmental Factors (CHIEF)
- Disabilities of the Arm, Shoulder, and Hand (DASH)
- Dynamometer
- The Early Coping Inventory (ECI)
- Evaluation Tool of Children's Handwriting Manuscript (ETCH)
- Hawaii Early Learning Profile (HELP) 3-6
- Home Falls and Accident Screening Tool (HOME FAST)
- Kitchen Task Assessment (KTA)
- Life Stressors & Social Resources Inventory - A (LISRES-A)
- Melville-Nelson Self Care Assessment (SCA)
- Model of Human Occupation Screening Tool (MOHOST)
- Occupational Circumstances Assessment Interview, Version 4 (OCAIRS, Version 4)
- Occupational Performance History Interview, 2nd Edition (OPHI-II)
- Occupational Self-Assessment (OSA)
- Occupational Therapy Driver Off-Road Assessment (OT-DORA)
- The Pediatric Evaluation of Disability Inventory (PEDI)
- The Pediatric Volitional Questionnaire (PVQ)
- Pinch Meter
- The Quick Neurological Screening Test 2nd Revised Edition (QNST-II)
- Safety Assessment of Function and the Environment for Rehabilitation (SAFER Tool)
- Safety Assessment of Function and the Environment for Rehabilitation Health Outcome Measurement & Evaluation (SAFER Home)
- School Setting Interview (SSI)
- Sensory Profile Questionnaire (SP)
- The School Function Assessment (SFA)
- The School Setting Interview (SSI)
- The Self-Discovery Tapestry
- Short Child Occupational Profile (SCOPE)
- Test of Handwriting Skills - Revised (THS-R)
- Test of Sensory Functions in Infants (TFSI)
- Tinetti Falls Efficacy Scale (FES)
- The Volitional Questionnaire 4.1 (VQ)
- The Work Environment Impact Scale (WEIS)
- Worker Role Interview (WRI)

Results

Forty-six assessments were reviewed. Some were based on specific theoretical models while others were not specific to theory but to function, performance, or impairment. The following chart

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includes the name, theory base, purpose, quality of psychometrics, usefulness as an outcome measure, and recommendations of the assessments reviewed.

Assessment tool	Theory based	Purpose	Quality of Psychometrics	Usefulness as an outcome measure	Recommendations
Ages & Stages Questionnaire (ASQ-3)	Developmental	To screen children ages 2-60 months for developmental delays (Squires & Bricker, 2015)	Excellent reliability and validity (Squires, Potter, Bricker, & Lamorey, 1998; Hornman, Kerstiens, de Winter, Bos, & Reijneveld, 2013; Veldhuizen, Clinton, Rodriguez, Wade, & Cairney, 2014; Schonhaut, Armijo, Schonstedt, Alvarez, & Cordero, 2013).	Useful as a quick screening tool; has excellent psychometrics and is easy to use	Consider writing versions that account for different cultures
The Assessment of Communication and Interaction Skills (ACIS)	Model of Human Occupation (MOHO)	ACIS is an assessment for the adult population that measures the impact of dysfunction on a person's communication and interaction skills while engaging in an occupation (Forsyth, Salamy, Simon & Kielhofner, 1998).	Very little psychometrics of reliability and validity. Simon (1989) found that 2 out of 22 items had low reliability and 16 items had low to moderate range ($r > +.17$ and $< +.76$) for single item stability (as cited in Forsyth, Salamy, Simon & Kielhofner 1998).	Not useful as an outcome measure due to lack of psychometrics and the subjectivity of the scoring.	Even though there is no training required to administer the ACIS, the administrator has to use their personal social competence in order to rate the individual's performance (Forsyth, Salamy, Simon & Kielhofner 1998).
Assessment of Motor and Processing Skills (AMPS)	Occupation based. Motor planning and	Observational assessment tool for clients age 2 years and older with almost any	Excellent psychometric properties across the board with extensive validity	Useful for outcomes measures. It can be used to track	None.

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	cognitive function.	diagnosis (Fisher and Jones, 2011).	studies with over 200K participants (Center for Innovative Solutions, 2015).	improvement in performance over time. The scoring software keeps previous score reports in the database for comparison and additional reports can be run within the software system.	
Bay Area Functional Performance Evaluation (BaFPE)	Neurological and developmental	Used to evaluate cognition in patients with psychological impairments, specifically with schizophrenia (Williams & Bloomer, 1987).	Excellent inter-rater reliability (0.9) and excellent concurrent validity (Williams & Bloomer, 1987).	Useful tool for outcome measure.	Yes, excellent tool that addresses emotional, social, and cognitive components. It is comprised of 5 sub tasks including sorting shells, money, and marketing, home drawing, block design, and kinetic person drawing (Williams & Bloomer, 1987).
The Beery-Buktenica Developmental Test of Visual Motor Integration (Beery VMI)	Developmental based	The Beery-VMI evaluates clients' ability to utilize their visual motor abilities, and can also be used to identify learning difficulties	According to Brown & Jackel (2007), "Rasch analysis demonstrated the total group item separation at 1.00 and total group	Useful as an outcome measure	The Beery-VMI is useful and it takes clients 10 – 15 minutes to complete the full form and subtests, then an additional 10

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		children may experience at a young age (Brown & Jackel, 2007).	person separation at 0.96” (p. 357). "Internal consistency, based on Cronbach’s alpha for the Beery VMI-5, the visual perception test, and the motor coordination subtest were 0.82, 0.81, and 0.82 respectively" (Brown & Jackel, 2007, p.357).		minutes for the administrator to score (Brown & Jackel, 2007).
Birth to Three Assessment and Intervention System - 2nd Edition (BTAIS-2)	Developmental	Measures global development in children between the ages of 0 and 36 months (Ammer & Bangs, 2002).	Lacks information on reliability and validity (Ammer & Bangs, 2002).	Useful, easy to score checklist of performance skills Scores from subtests are plotted on a graph that shows performance age in months.	Revise user manual to make more clear Perform psychometric research
Burks Behavior Rating Scales - 2nd Edition (BBRS-2)	Psychosocial Theory Base	Assists in the diagnosis and treatment of children and youth with behavioral problems (Burks, 2006)	Multiple studies confirming excellent reliability and internal consistency of alpha coefficients above 0.85 as well as validity of the tool (Burks, 2006).	Very thorough and useful tool. 100 items scored on 4 point Likert Scale. Scoring can be tedious due to wordy user manual.	Revise user manual to make more user friendly and scoring easier to complete and interpret.
Canadian Occupational Performance Measure (COPM)	Canadian Model of Occupational	Identifies the client’s self-perception of performance in self-care,	Reliability ranging from adequate-excellent and excellent validity (McCull, 2006).	Useful as an outcome measure tool.	This semi-structured interview format permits the client to share

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	Performance	productivity, and leisure activities for client-centered care (Eyssen, Steultjens, Oud, Bolt, Maasdam, & Dekker, 2011).	Paterson, Davies, Doubt, & Law, M. 2000).		what is important to them, allowing for client-centered care. This tool is sensitive to changes in the client's perspective and therefore a great tool in measuring outcomes.
Child Occupational Self-Assessment (COSA)	Model of Human Occupation	The COSA is an occupation-focused tool designed to allow the child the opportunity to identify their occupational performance in meaningful activities (Kramer, Kielhofner, and Smith, 2010).	The COSA lacks credibility in the psychometric properties. According to Kramer, Kielhofner, and Smith (2010), evidence for validity and reliability is inadequate due to large variations of client population and assessment administration variables. As a result, more research is currently being conducted to strengthen this area.	Not designed to be used as an outcome measure.	Although, the COSA is client-centered and occupation-focused, more research needs to be conducted in order to determine its clinical usefulness.
Children's Assessment of Participation and Enjoyment (CAPE) & Preferences for Activities	Developmental	Combined assessment used to evaluate a child's participation in daily activities outside of the school (King et al., 2004).	Adequate internal consistency reliability (0.6-0.77), adequate to excellent test-retest (0.64-0.86), and adequate content validity (King et al., 2004).	Useful as an outcome measure that focuses on the child's participation, diversity, intensity, with whom,	Yes, it is easy to administer, 55-item interview that takes about 30-35 minutes to complete the CAPE and 15-20 minutes for the PAC (King et al., 2004).

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of Children (PAC)				where, and overall enjoyment King et al., 2004).	
Clinical Observations of Motor and Postural Skills, 2nd Edition (COMPS-2)	A. Jean Ayres Classic Sensory Integration	Developed to have a standardized clinical observational tool for practitioners working with children and youth ages 5-15.11 years who have problems with motor coordination (Wilson, Kaplan, Pollock, and Law, 2000).	Very good test-retest scores but low inter-rater reliability and lack of validity testing (Wilson, Kaplan, Pollock, and Law, 2000).	Not useful as an outcome measure.	Look at revising the tool to have better inter-rater reliability and conduct more studies to confirm validity of this tool.
The Cognitive Assessment of Minnesota (CAM)	Neurological	Used to evaluate patients with brain injury (anoxia, traumatic brain injury, cerebral vascular, etc.) (Rustard et al., 1993).	Excellent test retest (0.96) and inter-rater (0.94) reliability (Rustard et al., 1993). Excellent concurrent validity after being evaluated with the Porteus Maze test and Mini Mental Status Exam (The University of Utah, n.d.)	Useful as an outcome measure tool.	Yes, this tool easy to administer, low in cost, and easy to score. It assesses mental functions focusing on attention, memory, though, calculations, and sensory functions, specifically assessing for visual neglect (Rustard et al., 1993).

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Craig Handicap Assessment and Reporting Technique (CHART)	World Health Organization (WHO) model.	“Measures the level of handicap experienced by an individual in a community setting” (Connolly, Law, & MacGuire, 2005, p. 270).	Excellent test-retest reliability (0.80 to 0.95) (Dijkers, 1991). Adequate to excellent criterion validity (Whiteneck, Charlifue, Gerhart, Overholser, & Richardson, 1992).	Useful as an outcome measure tool.	Yes, this tool is easy to use, free, and assesses areas of orientation, physical independence, mobility, occupation, social integration, and economic self-sufficiency (Whiteneck et al., 1992).
Craig Hospital Inventory of Environmental Factors (CHIEF)	World Health Organization (WHO) model of disability and the International Classification of Impairments, Disabilities, and Handicaps (ICIDH) Environmental Factors	Evaluates how environment influences the ability of the client to perform daily tasks and fulfill social roles Intended for use with clients who have physical or sensory disorders (Harrison-Felix, 2001).	Excellent test-retest reliability (ICC = 0.926) Ongoing psychometric studies to determine additional validity and inter-rater reliability (COMBI, 2012).	Not useful as an outcome measurement.	Include information about environmental facilitators Get a clearer view of the magnitude of the problem (not just “big” or “small” problem) Clarify what questions pertain to which subscale Add scoring instructions to the manual
Disabilities of the Arm, Shoulder, and Hand (DASH)	Biomechanical	A 30-item questionnaire, used for assessing individuals with injuries to the upper extremity.	More than five studies on the DASH indicated that its ICC had values between 0.91 and 0.96	Overall the review of the literature shows the DASH to be a quick,	This questionnaire can be self-administered or administered by the therapist.

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		<p>Questions ask about the individuals' symptoms as well as their ability to perform certain activities (Institute for Work and Health, 2006).</p>	<p>which means that the DASH is a reliable tool for clinical decision-making (Kolber, Salamh, Hanney, Cheng, 2014). Internal consistency was found to have a Chronbach's alpha between 0.96 and 0.97 (Beaton, Katz, Fossell, Wrights, Tarasuk, & Bombardier, 2001). The results from Gummesson, Atroshi, and Ekdahl's 2003 study allowed them to confirm that the DASH is capable of detecting both minute and large changes in function in their post-surgical participants with various upper extremity injuries. Construct validity was shown when the DASH was compared with several functional measures (Kolber, Salamh, Hanney, & Cheng, 2014). This same study by Kobler, Salamh, Hanney, and Cheng, 2014,</p>	<p>valid, reliable, and an effective tool to use on patients with upper extremity injuries.</p>	<p>The DASH can be completed in 6-30 minutes (Rehabilitation Institute of Chicago, 2010). No training is needed and the DASH questionnaire can be obtained online for free (Institute for Work and Health, 2006).</p> <p>Overall the review of the literature shows the DASH to be a quick, valid, reliable, and an effective tool to use on patients with upper extremity injuries.</p>
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			validated the high sensitivity of the DASH indicating that this tool can effectively measure outcomes and improvements in function or lack there of. After conducting their 2014 study on the DASH, Kolber, Salamh, Hanney, and Cheng concluded that the DASH is an assessment that is “reliable, valid, and responsive” (p.172).		
Dynamometer	Biomechanical	Used to assess upper extremity (UE) grip strength typically after 8-12 weeks of an injury (Kasch & Walsh, 2013).	Excellent intra-rater reliability (0.86-0.93) (Toeman, Dalton, & Sandford, 2011). Excellent concurrent validity (Bellace, Healy, Besser, Byron, & Hohman, 2000).	Useful as an outcome measure tool.	This tool is easy to use and takes about 5-10 minutes to conduct. Can also assess healthy adults, older adults, upper extremity injuries, and chronic injuries such as stroke, osteoarthritis, and muscle myopathy (Bertrand, Mercier, Bourbonnais, Desrosiers, & Gravel, 2007; Kasch & Walsh, 2013; Van Den Beld, Van Der Sanden, Sengers, Verbeek, & Gabreels, 2006;

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					Ziv, Patish, & Zeevi, 2008).
The Early Coping Inventory (ECI)	Developmental	<p>Aims to measure coping behaviors in children 4-36 months old</p> <p>Based on observation</p> <p>Test items divided into three broad coping-related categories: sensorimotor organization, reactive behavior, and self-initiated behavior (Zeitlin, Williamson, & Szczepanski, 1988)</p>	<p>Interrater reliability, test-retest reliability, and construct validity are good (Zeitlin, Williamson, & Szczepanski, 1988)</p>	<p>Can be useful when used in addition to other assessments to create a more detailed profile of the child and to help in intervention planning</p>	<p>Based on observation, so can be subjective; but highly recommended to supplement other assessments when completing an overall evaluation</p>
Evaluation Tool of Children's Handwriting Manuscript (ETCH)	Biomechanical and developmental	<p>ETCH is a criterion-referenced, standardized assessment designed to evaluate manuscript and cursive handwriting for children in grades one through six. The main focus of this assessment is to determine if a child's handwriting skills are equivalent to the required standards for that particular age group or classroom that they reside in (Duff & Goyen, 2010).</p>	<p>In the category of total word, ETCH reported an intra-rater score of .80, an inter-rater score of .62, and a test-retest score of .60 (Duff & Goyen, 2010).</p>	<p>Useful as an outcome measure.</p>	<p>ETCH is a fair assessment to determine a child's handwriting ability, but additional research must be conducted in order for this tool to be more widely accepted.</p>

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Hawaii Early Learning Profile (HELP) 3-6	Developmental	The Hawaii Early Learning Profile (HELP) 3-6 is a non-standardized assessment for children between the ages of three and six with or at risk for developmental delays (Teaford, Wheat, & Baker, 2010). The Help 3-6 assesses five areas of development including cognition, language, gross motor, fine motor, social-emotional, and self-help (Teaford, Wheat, & Baker, 2010).	The questions on the HELP 3-6 were derived from both standardized tests and trusted scales of development (Simon, 2014). Documented reliability of the HELP 3-6 is minimal and although it has been tested in the field, data is not available (Simon, 2014). Both content and face validity were obtained via literature review to support the HELP 0-3 which is an alternate version administered to younger children however no validity studies have been conducted specifically on the HELP 3-6 (Teaford, Wheat, & Baker, 2010).	The HELP 3-6 is useful as an outcome tool.	The HELP 3-6 is affordable at around \$57.00 and \$3.50 per score sheet (VORT Corporation, 2015).
Home Falls and Accidents Screening Tool (HOME FAST)	None Identified	The HOME FAST is used to identify an older adults fall risk, identify the need for a thorough falls assessment, and to help guide interventions related to fall risk (Mackenzie, 2009).	Overall good reliability with inter-rater reliability at 0.82 with a 95% confidence interval (CI), and test-retest reliability at 0.77 with a 95% CI (Vu and Mackenzie, 2012).	Useful as a quick screening tool; has good psychometric properties and is simple to administer; access at no cost	Further recommendation on additional research regarding validity with a larger sample size.

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			According to expert panels, content validity was greater than 0.8. Construct validity found that the HOME FAST was useful in identifying hazards in the home with a 95% CI (Mackenzie, Bytes, and Higginbotham, 2002b).		
Kitchen Task Assessment (KTA)	Cognition and motor planning	It is a functional measure that allows the practitioner to records the level of cognitive support the client needs, while completing a cooking activity (Baum & Edwards, 1993).	The inter-rater reliability was 0.853 for the total score (Furphy, 2014). The construct validity was based on correlations with cognitive and dementia tests as well as there were a high correlation coefficient 0.72 to 0.84 (Furphy, 2014).	The KTA can be used as an outcome measure.	Publish additional studies that utilize the kitchen task assessment.
Life Stressors & Social Resources Inventory - Adult form (LISRES-A)	None Identified	Examines the relationship between life stressors and social resources during evaluation of their impact on health and well-being for clients (Gitlow, 2007)	The test retest reliability for males was 0.12 to 0.60, while for females it was 0.16 to 0.69, with a 12-15 month interval (Gitmo, 2007). No information regarding convergent validity is available, but content validity consisted of indices created	Useful as an outcome measure	No spirituality items are included and this should be considered for future LISRES revisions.

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			from original literature search and research with two pilot studies with client who were healthy, depressed, and alcoholic and had arthritis (Rigby, Cooper, Letts, Stewart, & Strong, 2005).		
Melville-Nelson Self Care Assessment	Performance-specific	To objectively measure performance and support for seven ADLs for clients in sub acute and SNF settings (Nelson & Melville, 2001)	Concurrent validity with FIM is -.85 and Klein-Bell is -.86. Good predictive validity for caregiving time. Inter-rater reliability is 0.94 and test-retest is not reported. (Nelson et al., 2002)	One page, easy-to-score checklist that can be especially useful for those who must complete the Minimum Data Set (MDS)	Additional research on psychometrics to further support assessment Modify way of documenting "Support Needed" so that needed support can be specified for each component of the task
Model of Human Occupation Screening Tool (MOHOST)	Model of Human Occupation	The Model of Human Occupation Screening Tool (MOHOST) is an assessment that is created to document progress achieved through occupational therapy intervention and a screening tool to determine if occupational therapy services are needed (Parkinson,	In the study of Kielhofner et al, 2010, the reliability ranged from .81 to .89. Discriminate validity was analyzed using ANOVA analyses, in which all subscales achieved a level of significance smaller than the concerned p value (Parkinson et al., 2006).	Useful as an outcome measure	Could benefit from additional research to strengthen its psychometric properties. Otherwise, it is a good assessment to utilize.

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		Forsyth, & Kielhofner, 2006).			
Occupational Circumstances Assessment Interview, Version 4 (OCAIRS, Version 4)	Model of Human Occupation	The OCAIRS is an interview used to determine how intrinsic and extrinsic barriers interfere with an individual's ability to perform chosen occupations. It can be used with clients from adolescent to adult age with a wide range of physical or cognitive disabilities (as long as the client is able to understand the questions and answer appropriately (Forsyth, Deshpande, Kielhofner, Henriksson, Haglund, Olsen, Skinner, and Kulkarni, 2005).	There is limited psychometric information for reliability and validity (Forsyth, Deshpande, Kielhofner, Henriksson, Haglund, Olsen, Skinner, Kulkarni, 2005).	The OCAIRS is not useful as an outcome measure. It can only measure potential barriers to performance.	Additional psychometric testing is recommended.
Occupational Performance History Interview, 2nd edition (OPHI-II)	Model of Human Occupation (MOHO)	The OPHI-II is an interview tool used to assess a client's life history and occupational identity while taking into account environment (Schultz-Krohn, 2014).	Test-Retest Reliability is not available. There is only observable validity. Rasch analysis indicated that OPHI-II is valid in detecting occupational performance (Schultz-Krohn, 2014).	Useful for identify occupational identity and detailed life history (Schultz-Krohn, 2014).	Assessment is lengthy, it takes about total 2 hours for interview and scoring (Schultz-Krohn, 2014).
Occupational Self-	Model of Human	The Occupational Self-Assessment (OSA) is used with	Rasch analysis was utilized and no item misfits	Useful as an outcome measure	Additional research is needed for the

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Assessment (OSA)	Occupation	clients age 12 and older, who are able to evaluate and provide information regarding their occupational competence, occupational functioning importance, as well as environmental adaptation (Schultz-Krohn, 2007).	were identified, which indicates that all scales have internal validity (McColl & Pollock, 2005).		reliability aspect of OSA
Occupational Therapy Driver Off-Road Assessment (OT-DORA)	None Identified	The OT-DORA is an impairment-based assessment made up of multiple test that will allow efficient evaluation of an individual's cognitive, perceptual, behavioral, physical, and sensory skills and abilities that are related to driving, prior to an on-road assessment (Unsworth, Pallant, Russell, & Odell 2011).	Inadequate. Reliability Inter-rater – 3-5 practitioners rating 4 clients. .8 to 1.00 (perfect agreement); Sensitivity & Specificity for the Heel Pivot component: Sensitivity 29.03%, Specificity 89.60% (Unsworth, Pallant, Russell, & Odell 2011).	Not designed to be an outcome measure, only a recommendation tool.	Further research needs to be conducted, before this assessment can be widely accepted.
The Pediatric Evaluation of Disability Inventory (PEDI)	Developmental	The PEDI is a standardized comprehensive occupation based standardized assessment that evaluates the functional skills and level of independence for 6 month-7.5 year	The PEDI has excellent inter-rater reliability with an intraclass correlation coefficient (ICC) of 0.67 to 1.00 for functional skill scales and 0.68 to 0.90 for caregiver	Useful for assessing the child's functional skills, level of caregiver assistance, and environmental modificatio	

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		<p>old children with a variety of physical and cognitive disabilities (Haley, Coster, Ludlow, Haltiwanger & Andrellos, 1992)</p>	<p>assistance scales (Haley et al., 1992). The PEDI also has excellent internal consistency of 0.95 and 0.99 for all six scales using Cronbach's alpha (Haley et al., 1992). More than two studies were conducted to prove the PEDI had convergent and construct validity (Letts & Bosch, 2005). The PEDI's test-retest ICC was more than 0.95 for total scores and above 0.80 for the three domains (Wright and Boschen, 1993). Its convergent validity was determined by comparing it to other developmental instruments such as the Battelle Developmental Inventory Screening Test with results of 0.62 to 0.97 and the WeeFIM with results from 0.80 to 0.97 (Nichols and Case-Smith, 1996).</p>	<p>ns needed to perform tasks in the areas of self-care, mobility, and social function (Haley et al., 1992)</p>	
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The Pediatric Volitional Questionnaire (PVQ)	Model of Human Occupation (MOHO)	The PVQ is an observational assessment for children 2-7 years old that determines a child's inner motivation and examines how the environment strengthens or weakens their volition (Basu, Kafkes, Schatz, Kiraly & Kielhofner, 2008).	Adequate validity was determined using Rasch analysis and the PVQ outcomes correlated with the Test of Playfulness ($r=0.47$) (Bundy, 2005).	It is useful for determining how much support the child requires in order to increase the child's active participation in therapeutic activities. This should be taken into consideration when developing goals for the child (Basu, Kafkes, Schatz, Kiraly & Kielhofner, 2008).	The manual recommends observing the child during different parts of the day and in various environments (Basu, Kafkes, Schatz, Kiraly & Kielhofner, 2008). Needs further research on reliability and validity.
Pinch Meter	Biomechanical	The Pinch Meter or Pinch Gauge is a device used to measure pinch strength during a hand strength evaluation and is commonly used by Occupational Therapists. The pinch meter assesses three types of pinch strength including palmer pinch, key pinch, and tip pinch strengths (Mathiowetz et al., 1985).	Reliability and validity studies for the Pinch Meter are limited and outdated. Adequate test-retest reliability was best attained when practitioners found the mean of three trials (Mathiowetz, Weber, Volland, & Kashman, 1984). Intraclass consistency was excellent when comparing the	Very useful for tracking progress and overall strength of an individual.	In their 1985 study, Mathiowetz et al. recommended several techniques that practitioners can use to optimize the validity and reliability when using the Pinch Meter. These techniques include proper positioning of client, finding the mean of three trials per

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			<p>results of various Pinch Meter brands including Jamar ®, B & L Engineering, JTech, and NK brands (MacDermid, Evenhuis, & Louzon, 2001). MacDermid, Evenhuis, & Louzon, (2001) also found that there is poor interclass correlation coefficients (ICCs) when comparing the classic Jamar ® hydraulic Pinch Meter with the more modern electronic Jamar ® Pinch Meter indicating the importance of consistently using the same type of meter when assessing and re-assessing a client.</p>		<p>measurement, using the same pinch meter for evaluation and re-evaluations, and regular calibration of the Pinch Meter (Mathiowetz et al., 1985).</p>
<p>The Quick Neurological Screening Test 2nd Revised Edition (QNST-II)</p>	<p>Development, age appropriate, neurological and neuropsychological theory and framework (Mutti, Martin, Sterling &</p>	<p>QNST-II is a performance based standardized screening that screens for learning disabilities .It tests for soft or subtle signs of impairments that could impact the skills needed to engage in the occupation of</p>	<p>Adequate to excellent psychometrics. The screening has excellent test retest reliability in that the coefficient was 0.81, and adequate interrater reliability of experienced administrators was</p>	<p>Useful as a screening, but the QNST-II alone can't be used to diagnose someone with a learning disability (Mutti et al., 1998).</p>	<p>It is highly suggested that someone receives training before administering this screening (Mutti et al., 1998). There is a Quick Neurological Screening Test</p>

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	Spalding, 1998)	school (Mutti et al., 1998).	0.71 and 0.69 for new administrators (Mutti et al., 1998). Validity for the QNST-II was excellent because there were more than two studies to test its construct and concurrent validity. It was determined that the QNST-II has moderate to strong construct, content, and criterion related validity (Mutti et al., 1998).		3rd Edition (QNST-3).
Safety Assessment of Function and the Environment for Rehabilitation (SAFER Tool)	None identified	Identify the safety issues that geriatric populations have in their natural environment (Rigsby, Cooper, Letts, Stewart & Strong, 2005).	Adequate-Excellent validity and reliability (Rigsby, Cooper, Letts, Stewart & Strong, 2005).	Not a useful tool as an outcome measure.	This tool would be helpful in creating a treatment plan that is client-centered.
Safety Assessment of Function and the Environment for Rehabilitation Health Outcome Measurement and Evaluation (SAFER HOME)	None identified	Measures change in safety of geriatric patients in their natural setting over time (Rigsby, Cooper, Letts, Stewart & Strong, 2005).	Adequate, needs further support (Rigsby, Cooper, Letts, Stewart & Strong, 2005).	A useful tool in outcome measure.	This is a comprehensive tool to measure change in safety for the geriatric population that have physical disabilities and/or mental illness in their natural environment (Rigsby, Cooper, Letts, Stewart & Strong, 2005).

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School Setting Interview	Model of Human Occupation (MOHO)	Used to determine the degree of fit between the environment and student. Intended to be used with children 10 years and older who have physical disabilities (Hemmingson, Egilson, Hoffman, & Kielhofner, 2005).	Construct and content validity are good, and inter-rater reliability is good (90%) for most content areas (Hemmingson, Egilson, Hoffman, & Kielhofner, 2005).	Useful for determining what aspects of the environment/person should be adapted or modified in order to improve school performance	Highly recommended for use with the intended population Expand for use with children who are younger and with children who have other disabilities
Sensory Profile Questionnaire (SP)	Sensory Integration	The Sensory Profile is a norm-referenced assessment designed to identify possible contributions of sensory processing to the client's daily performance patterns (Haynes, 2014).	Adequate. According to Haynes (2014), internal consistency for every section varied from 0.57 to 0.93, while test-retest reliability was reported at 0.83 to 0.97 (Haynes, 2014, p. 417). Lastly, interrater reliability was reported at 0.49 to 0.89 for children and 0.53 to 0.90 for school age adolescents (Haynes, 2014)	A useful tool as an outcome measure	This tool will be useful to determine baseline measures when treating clients with sensory processing disorders.
The School Function Assessment (SFA)	Model of Human Occupation	Identifies the child's strengths and weaknesses in completing typical functional tasks in an academic setting (Coster, Mancini, & Ludlow, 1999).	Excellent. (Coster, Mancini, & Ludlow, 1999).	A useful tool in outcome measure.	Not valid for clients that have sustained a traumatic brain injury, and high interrater reliability (Davies, Soon, Young, & Clausen--Yamaki, 2004).

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The Self-Discovery Tapestry	None.	Allows for self-reflection and visualization of how life events affect daily occupations (Meltzer, 2011).	None.	Not useful as an outcomes measure.	Helpful for clients that are transitioning into a new phase in life, providing a safe environment to self-reflect and raise self-awareness. Also beneficial in future planning with clients.
Short Child Occupational Profile (SCOPE)	Model of Human Occupation (MOHO)	Observational tool to assess how intrinsic and extrinsic factors affect the performance of children with a variety of physical and mental disability diagnoses (Bowyer et al., 2008).	No evidence available for any psychometric properties (Bowyer et al., 2008).	Not useful as an outcome measure due to lack of test-retest psychometric properties.	Conduct psychometric testing to establish reliability and validity.
Test of Handwriting Skills - Revised (THS-R)	Impairment based	The Test of Handwriting Skills – Revised (THS-R) was developed by Dr. Morrison Gardner to assess the handwriting skills of students in either manuscript or cursive. This assessment is impairment based, and evaluates neurosensory integration problems that are manifested in the handwriting of students, which is useful for planning	Coefficient alpha and Spearman-Brown reliability coefficients were calculated by participants' age group and the coefficients showed moderate to high, with medians of 0.61 to 0.85 for the manuscript format, and 0.65 to 0.92 for the cursive format, with majority of the subtest reliability coefficients exceeding 0.80 (Milone, 2007).	Useful as an outcomes measure.	Occupational therapists can administer the THS-R, as well as psychologists, resource specialists, special education teachers, and affiliated professionals (Milone, 2007).

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		interventions (Milone, 2007).	For interrater reliability, agreement among the raters was high and ranged from 0.59 to 1.00 with typical correspondence ranging from 0.75 to 0.90 (Milone, 2007).		
Test of Sensory Functions in Infants (TFSI)	Jane Ayres Classic Sensory Integration	This tool is designed to test for possible sensory processing or developmental delays in infants from 4 - 18 months of age (DeGangi and Greenspan, 1989).	Excellent reliability scores and multiple validity studies showing strong correlation to gold standard tools in sensory function (DeGangi and Greenspan, 1989).	Not useful as an outcome measure. Only screens for potential delays.	None. Advanced review and practice with administration is recommended.
Tinetti Falls Efficacy Scale (FES)	International Classification of Functioning, Disability and Health (ICF): activity and Participation (“Rehab Measures-Tinetti Falls Efficacy Scale,” n.d.)	Evaluates one’s perceived efficacy or self-confidence with their balance and stability during non-hazardous ADLs. It also evaluates fear of falling in the adult population (Tinetti, Richman & Powell, 1990).	Adequate to excellent test-retest reliability as proved by two different studies. Adequate to excellent criterion and convergent validity with two different studies conducted for each (Hotchkiss, Fisher, Robertson, Rutencutter, Schuffert & Barker, 2004; Powell & Myers, 1995; Tinetti, Richman & Powell, 1990).	Useful as an outcome measure.	Would recommend using the latest versions of the FES, which are the Modified FES and the Falls Efficacy Scale International as these include community and social activities respectively (Helbostad, Taraldsen, Grandbo, Yardley, Todd & Sletvold, 2010). Also the score is less subjective in these two versions.

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The Volitional Questionnaire 4.1 (VQ)	Model of Human Occupation (MOHO)	The Volitional Questionnaire is a quick and easy way to assess an individual's motivation and inner drive. This assessment is unique as it evaluates how the environment affects an individual's volition (Jen-Suh, Kielhofner, Gloria de las Heras, and Magalhaes, 1996).	Only inter-rater reliability is available. Inter-rater reliability was found to be excellent at >0.90 (Jen-Suh, Kielhofner, Gloria de las Heras, and Magalhaes, 1996).	The Volitional Questionnaire 4.1 is useful to evaluate volition in individuals.	The Volitional Questionnaire 4.1 is cheap (\$40), easy to use and takes only minutes to administer.
The Work Environment Impact Scale (WEIS)	Model of Human Occupation (MOHO)	(WEIS) Version 2.0 is an occupation-based assessment that assesses 17 environmental factors that impact the worker's performance, gratification and well being. The WEIS can be used for adults with physical and/or psychosocial disabilities. (Moore-Corner, Kielhofner & Olson, 1998).	Very little psychometrics. Corner, Kielhofner and Lin (1997) used fit statistics; including mean squared standardized residual (MNSQ) and the standardized mean square ($\hat{\lambda}$) to determine construct validity (Corner, Kielhofner & Lin, 1997). In general "the person and item separation index is low at 1.63 and 1.57 respectively" (Corner, Kielhofner & Lin, 1997, p.26), meaning that the items aren't very good at separating people	Not useful as an outcome measure.	

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			into different skill levels (Corner, Kielhofner & Lin, 1997). The reliability of these approximations is adequate at 0.73 and 0.71(Corner, Kielhofner & Lin, 1997)		
Worker Role Interview (WRI)	Model of Human Occupation (MOHO)	For workers that are injured or disabled in identifying the environmental and psychosocial factors of their jobs that dictate when they can return to work (Reed, 2014).	Excellent validity and reliability scores (Reed, 2014).	Not recommended as a tool to measure outcomes.	Helpful when used with other physical capacity evaluation assessments in determining the client’s ability and needs in preparation for returning to work.

In reviewing these assessments we identified those assessments that were effective for occupation-based outcome measurement and those that were more focused on client factors that contributed to occupational performance. Based on the findings of this review, the occupation based outcome measures that the authors recommend for use are: AMPS, BaFPE, COPM, CAPE/PAC, CHART, DASH, ETCH, KTA, OPHI-II, PEDI, SFA, THS-R, WRI.

While on the other hand, the assessments that were found to have more emphasis placed on client factors that support occupational performance were: ASQ-3, ACIS, AMPS, BaFPE, Beery VMI, BTAIS-2, BBRS-2, COMPS-2, CAM, dynamometer, ECI, HELP 3-6, MOHOST, pinch meter, QNST-2, SSI, SP, TSFI.

As identified in the results section of this paper, it is evident that not all of the assessments studied have attained strong psychometric support. Several of these studies have the potential to be great evidence-based resources for occupational therapy practitioners, but require more research to confirm that they have multiple forms of validity and reliability. Assessments that would benefit from further research because the psychometric support is less than excellent or lacking entirely include: CHIEF, COSA, HOME FAST, LISRES-A, Melville Nelson SCA, OCAIRS-4, OSA, OT-DORA, PVQ, SAFER Home, SAFER Tool, SCOPE, Tinetti FES, VQ, WEIS.

Discussion

Implications for practice

The measurement tools discussed above can be used in a variety of settings with a number of populations. Obviously some tools are better in one particular setting or population than others. As occupational therapy practitioners, it is crucial to understand the strengths and weaknesses of each measurement tool as well as the appropriate setting, population, and specific situation in which to use each one during the occupational therapy process. It is the hope of the authors that this article will assist with the identification of the measurement tool for each clinical situation.

Ultimately the selection of assessment or screening tool will result in quality information being gathered so that practitioners are able to create effective, client-centered, occupation-based treatment plans. Additionally, quality outcomes will enhance the practitioners' ability to obtain successful reimbursement for services provided, and it may ideally expand the list of services for which we can be reimbursed. Occupational therapy can then continue to grow as a profession, and more people will be able to benefit from the services we offer.

Implications for education

In order for new practitioners entering the field of occupational therapy to be prepared to provide best practice, educational programs must be equipped to select and provide students with access to a variety of psychometrically supported measurement tools. While some of the measurement tools discussed above presented with psychometric concerns, it is still important for students to also study these tools from an analytical perspective so they are prepared upon entering the workforce to critically review the assessments and screening tools they are using on a daily basis. By reviewing measurement tools on a broad spectrum of psychometric ratings, students will be more prepared to evaluate tools upon entering the workforce and affect change in the clinical setting.

Implications for research

Occupational therapists not only need to appraise and improve the available assessments. In addition, they need to spend time developing assessments with quality psychometrics that measure occupational performance outcomes.

Limitations

This is not a comprehensive list of all of the available assessments used in occupational therapy practice and research. This review may contain the authors' subjective perspectives of the assessments.

Conclusion

In order for an occupational therapy practitioner to develop an evidence-based intervention plan, a valid measurement process known as the evaluation must take place (Law, Baum, & Dunn, 2012). As previously mentioned, the evaluation is an essential part, as it not only determines the baseline of a client's occupational performance, but it also helps provide evidence of the effectiveness and proficiency of the occupational therapy intervention. Although every practitioner is aware of the importance of the measurement process, actually implementing this vital component in daily practice can be quite challenging. Some of the barriers new and seasoned practitioners face include but are not limited to: lack of time, determining what to measure, using the results to make clinical decisions, and most importantly finding the right assessment tool (Law, Baum, & Dunn, 2012).

As a result, the purpose of this review was to analyze and discuss the evidence supporting the use of assessments to measure occupational performance and occupation-based outcomes. Forty-six assessments that are commonly used in today's practice were evaluated using the Outcome Measures Rating Form and Guidelines from the CANCHILD Center for Disability Research Institute of Applied Health Sciences, McMaster University (Law, 1994). Hopefully, this review will promote further systematic reviews on outcome measurements, assist with the identification of the appropriate measurement tool for each clinical situation, and help reduce some of the barriers practitioners may face when trying to implement occupational performance and occupation-based measurements into their practice. We recommend continued review and refinement on the psychometric properties of all assessments used by occupational therapy practitioners.

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